

IMAGING RADAR STUDIES OF POLAR ICE

Frank Carsey
Jet Propulsion Laboratory
California Institute of Technology

5/3-43
182853
P-9

Topics

- Scientific Overview
- Radar Data Opportunities
- Sea Ice Investigations
- Ice Sheet Investigations
- Conclusions

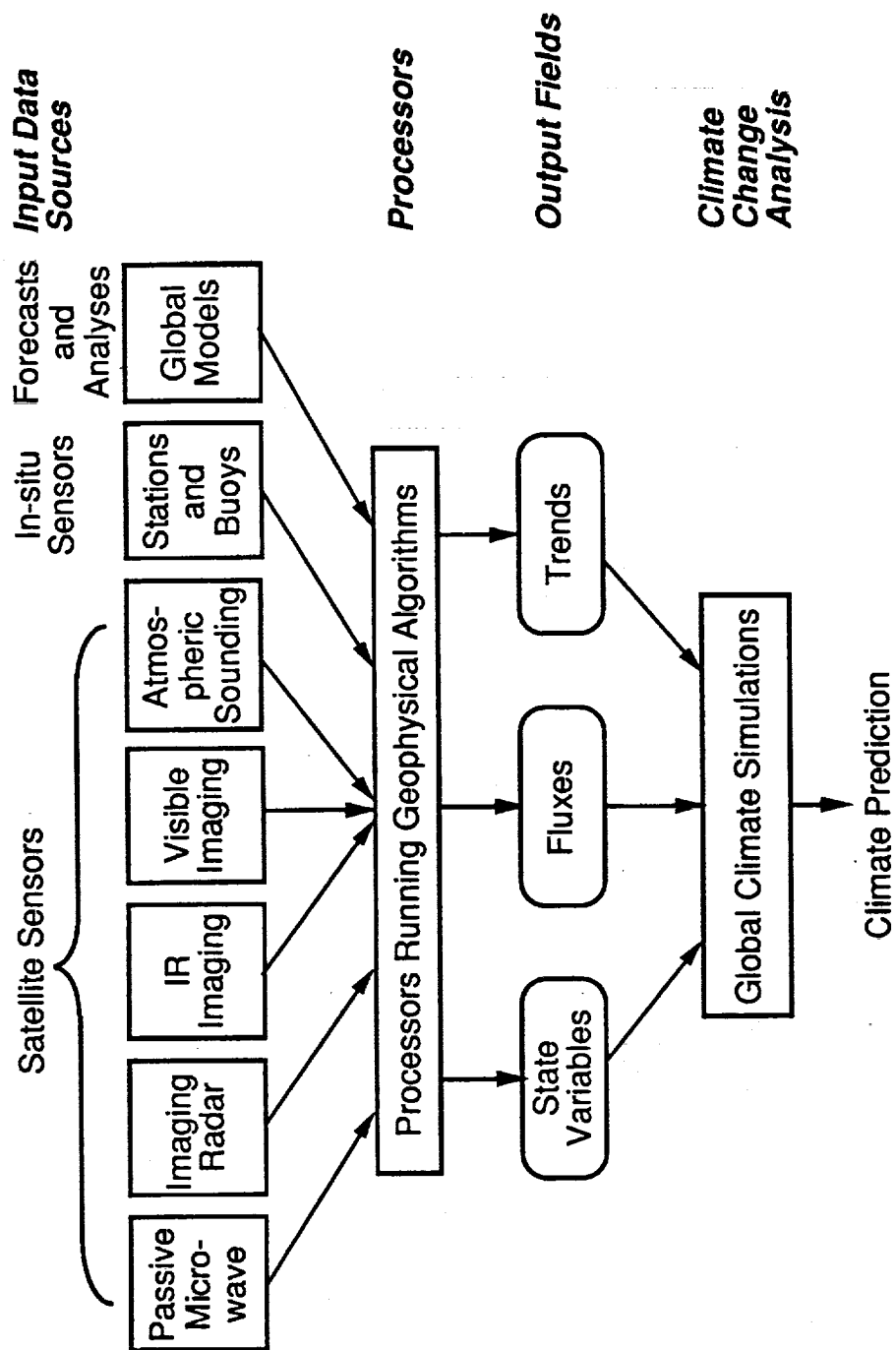
Scientific Overview

Sea Ice Scientific Objectives:

- To estimate globally the surface brine generation, heat flux, and fresh water advection (as ice).
- To monitor phasing of seasonal melt and freeze events and accurately estimate melt and growth rates.
- To develop improved treatment of momentum transfer and ice mechanics in coupled air-sea-ice models.

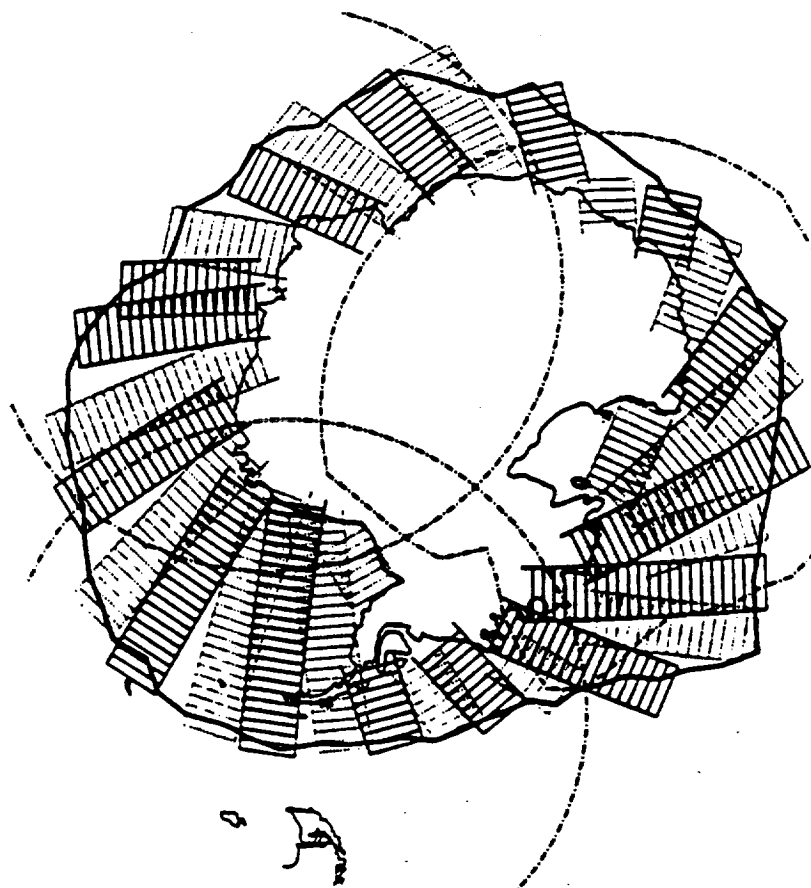
Key Radar Observations: Ice Type and Velocity

STUDY PHILOSOPHY, UNDERSTANDING THE ROLE OF SEA ICE IN CLIMATE

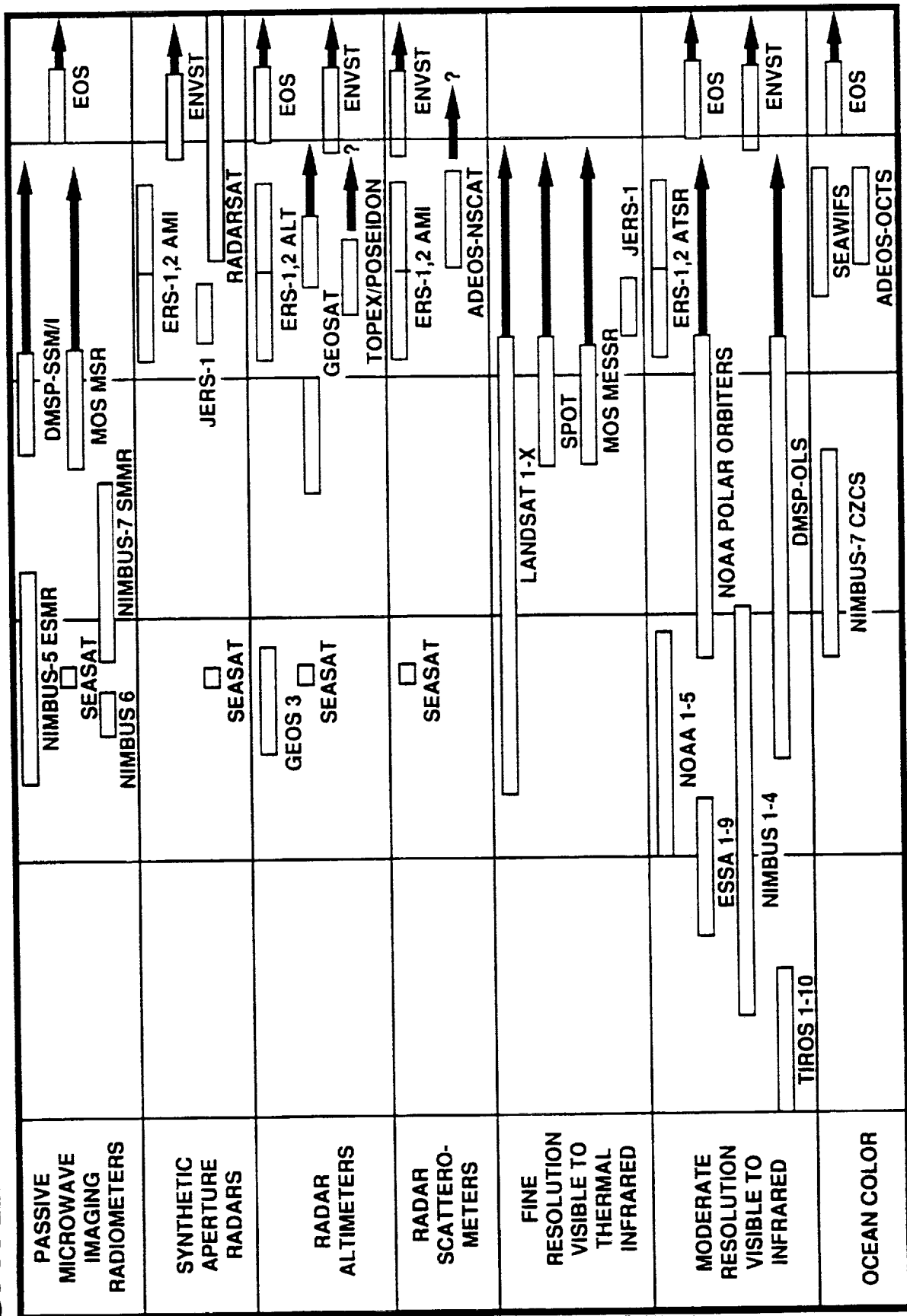


September 1975 ESMR Maximum Ice Edge
 Day 1 Total Time: 58 minutes
 Day 3 Total Time: 59 minutes

RADARSAT Data Coverage (500Km Swath): Days: 1 (Bold) and 3 (Dotted)
 McMurdo, Bernardo O'Higgins, Syowa Station Masks at 3 Deg. Elev.
 Ascending Data Only: 15 Sec. time steps

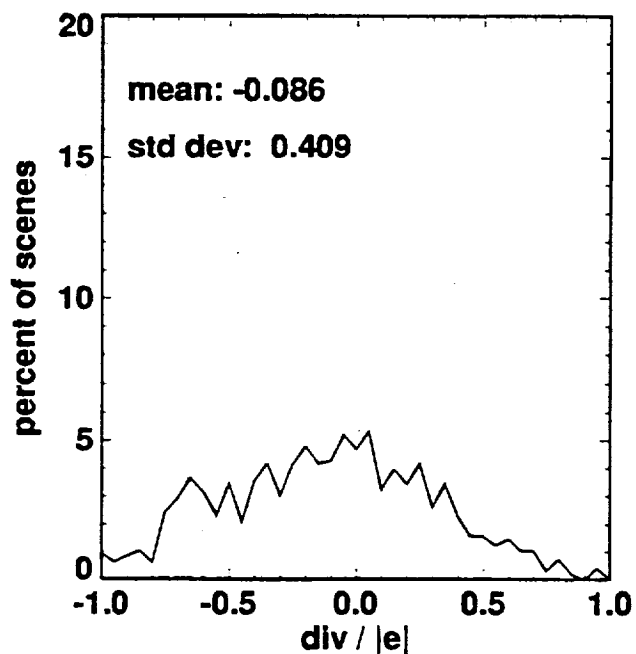
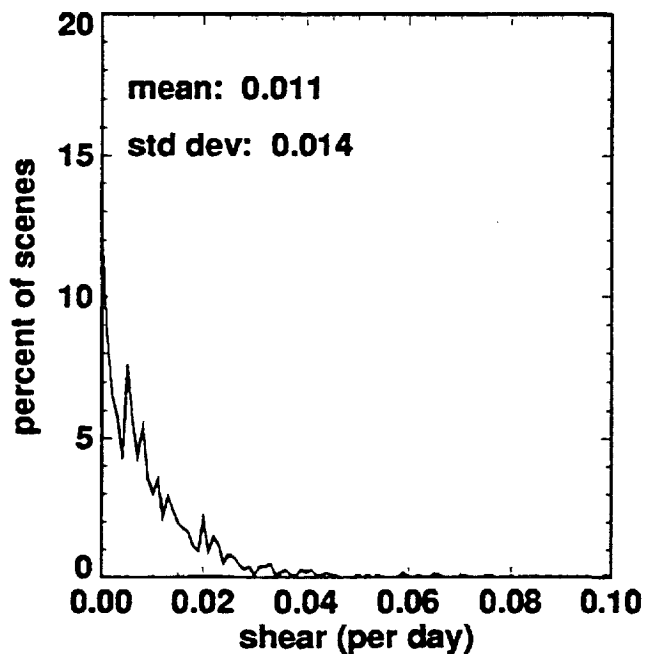
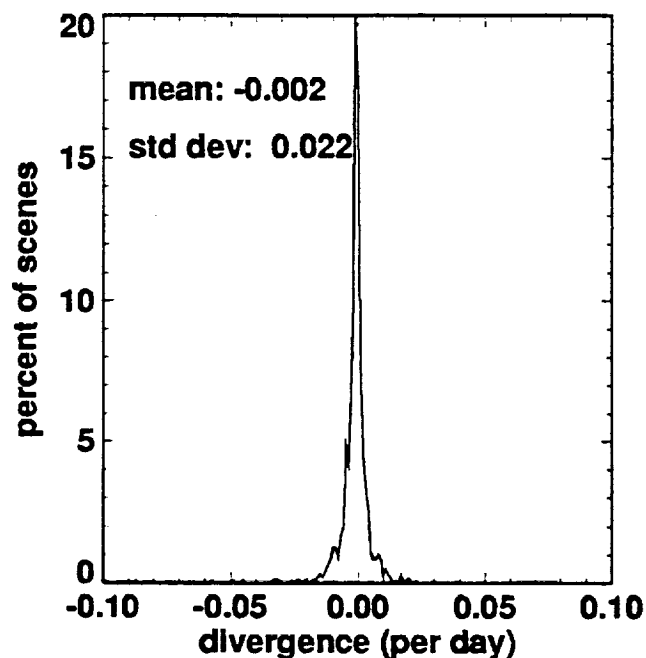
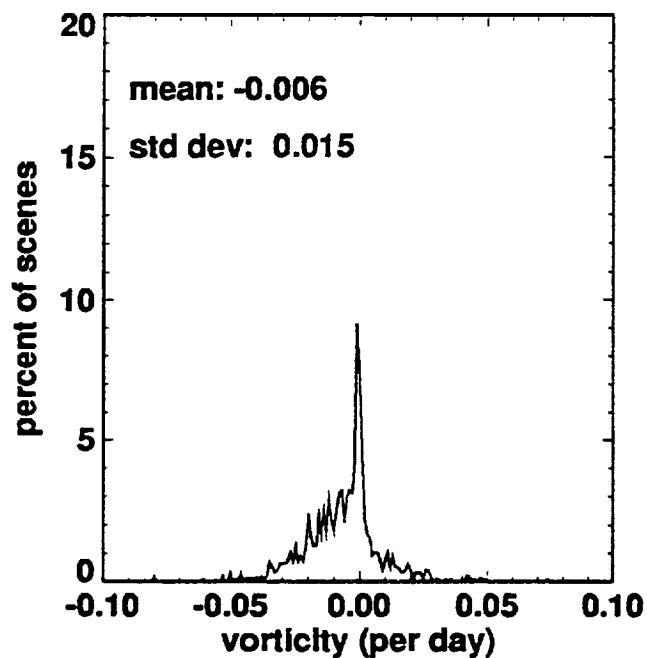


SATELLITE DATA SETS FOR SEA ICE OBSERVATIONS

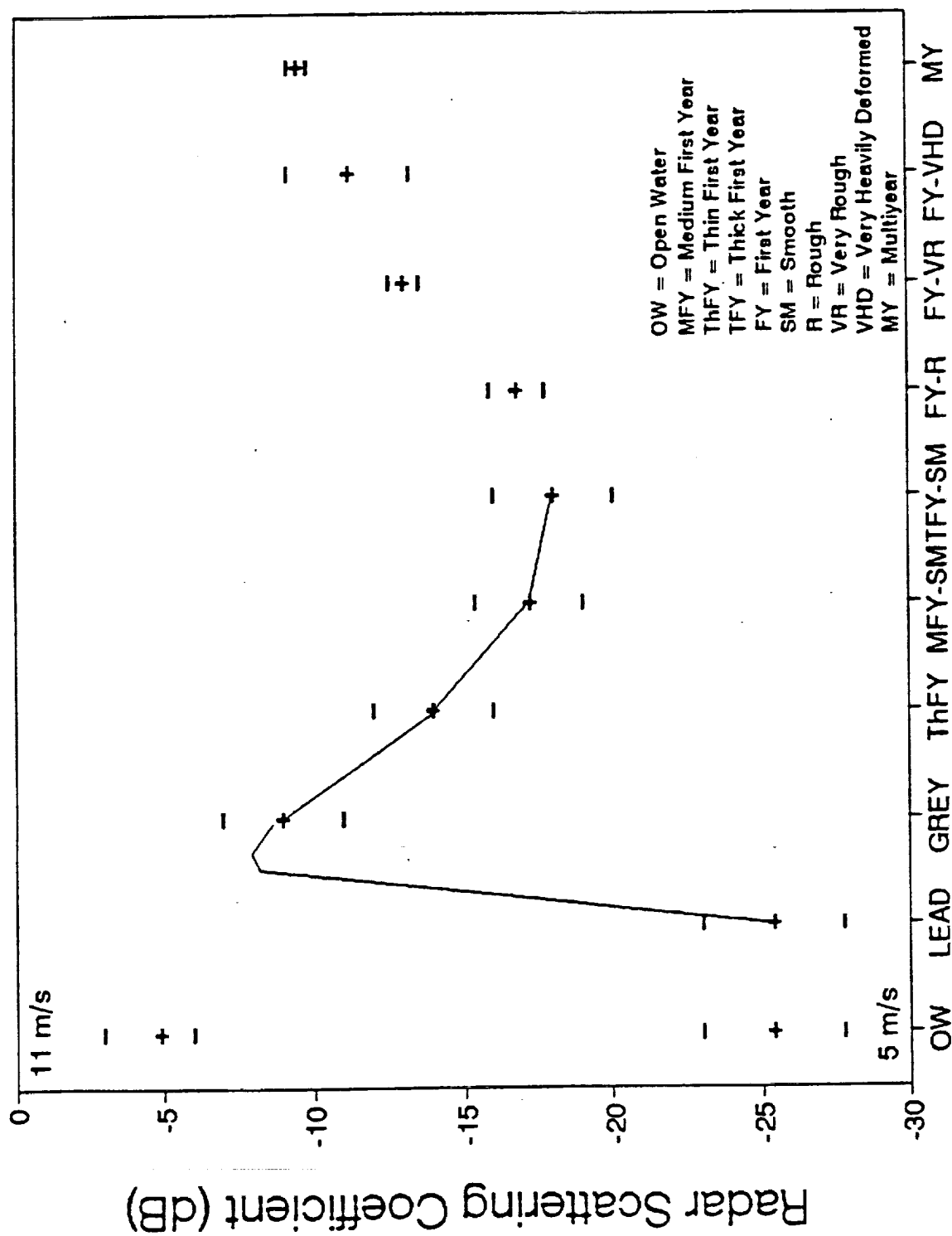


Statistics of Ice Deformation

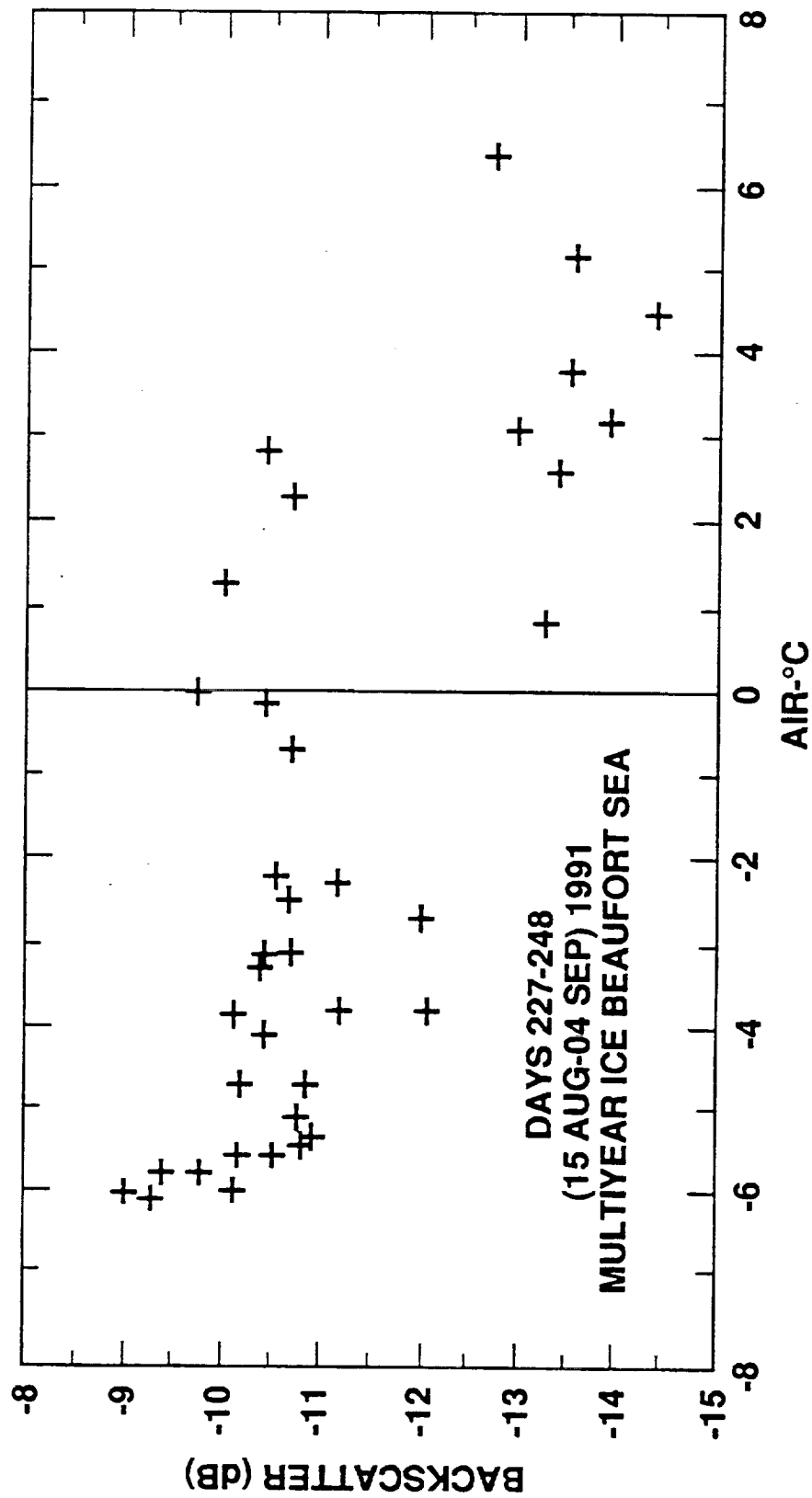
Average over SAR Scenes



ERS-1 SAR / Beaufort Sea / LEADEX'92



SEASONAL CHANGE IN ERS-1 BACKSCATTER



Radar Opportunities

- Systems Now Deployed in Space:
ERS-1, JERS-1
- Ground Station SAR Processors, Geophysical Processors
International Collaboration--Could Improve
- Systems Approved for the Near Term, Far Term
RADARSAT (Coverage)
- Proposed Systems for the Far Term
- Airborne Systems, Polarimetric Data
- In-Situ and Laboratory Scatterometers
- Historical Data

In Summary: Data Opportunities are Excellent.
Will Funded Research Opportunities Keep Up?

Scientific Overview

Ice Sheet Scientific Objectives

- To Map and Classify the Ice Sheets According to Dominant Processes in the Mass budget
- To Monitor the Calving Ice Flux From Greenland and Antarctica

Key Radar Observations: Surface Conditions, Ice Velocity

RADAR INVESTIGATIONS OF GREENLAND ICE SHEET ZONATION

